

BECK (C.)

*Compliments of the Author*

# SUBPHRENIC ABSCESS

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## SUBPHRENIC ABSCESS.<sup>1</sup>

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BUT few years have elapsed since subphrenic abscess was granted a place in medical literature. It is therefore not surprising that even the most modern and complete text-books lack a description of this important condition.

So far as my knowledge goes, R. F. Weir,<sup>2</sup> S. J. Meltzer,<sup>3</sup> A. L. Mason, and Osler are the only ones in this country besides me who have published cases.

Notwithstanding surgery owes most of its recent development to advances of the natural sciences, especially bacteriology, yet here surgery has been the donor by disclosing to pathology as well as to internal medicine the mysteries of this disease.

It was reserved to the genius of a Richard von Volkmann<sup>4</sup> to show, as early as 1879, that abscesses situated below the diaphragm can be reached and cured by the knife. His bold yet successful procedure of opening the pleural cavity and incising the diaphragm called the interest of the whole medical world to this new subject.

In the following year Leyden<sup>5</sup> published his views upon this condition from the standpoint of general medicine, and to him is due the credit of having

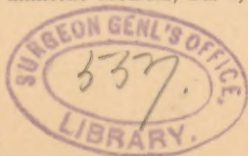
<sup>1</sup> Read at the stated meeting of the New York Academy of Medicine, February 6th, 1896.

<sup>2</sup> MEDICAL RECORD, February 13, 1892.

<sup>3</sup> Internationale klinische Rundschau, 1893, Nos. 29, 31, 34.

<sup>4</sup> Verhandlungen der Deutschen Gesellschaft für Chirurgie, Bd. 8, 1879, p. 19.

<sup>5</sup> Zeitschrift für klinische Medicin, Bd. 1, p. 320.



offered the first clear and simple methods for its diagnosis. How much the knowledge of this subject has increased is evident from the fact that, while from 1879 to 1890 only twenty-eight operations were performed for subphrenic abscesses, the period from 1890 to 1893 shows thirty-two cases. The record has since risen to one hundred and seventy-nine cases, seventy-five of which were operated upon.<sup>1</sup> Notwithstanding the long array of cases, there are many points concerning the origin of subphrenic abscess that still remain obscure. This is the more to be deplored in that here, as in many other suppurative processes, early diagnosis is essential to successful surgical treatment. Even the most thorough observers sometimes meet with great difficulties in diagnosis, difficulties which can be overcome only by clearing up the manifold etiological factors.

A noteworthy effort in this direction was recently made by K. Maydl,<sup>2</sup> who classified subphrenic abscesses into twelve groups, according to their anatomical point of origin. At the same time the primary disease causing the abscess was considered, whenever possible. Since diagnosis and prognosis, as well as therapy, are naturally dependent upon the seat of the primary affection, anatomy has served also as the basis for my own deductions. It is fitting, therefore, before going further, to consider the topography and pathological anatomy of the disease as the foundation for diagnosis, prognosis, and therapy.

**Topography.**—The subphrenic space, in which subphrenic abscess forms, is bounded by the epigastrium and the two hypochondria. The right hypochondrium contains the right lobe of the liver, the sharp lower margin of which is overlapped by the gall bladder in the region of the cartilages of the ninth and tenth ribs. Below the liver is the right half of the transverse

<sup>1</sup> W. Sachs, *Centralblatt für Chirurgie*, May 25, 1895.

<sup>2</sup> "Ueber subphrenische Abscesse," *Wien*, 1894.



colon. The right suprarenal capsule and the upper margin of the right kidney, which always leaves a

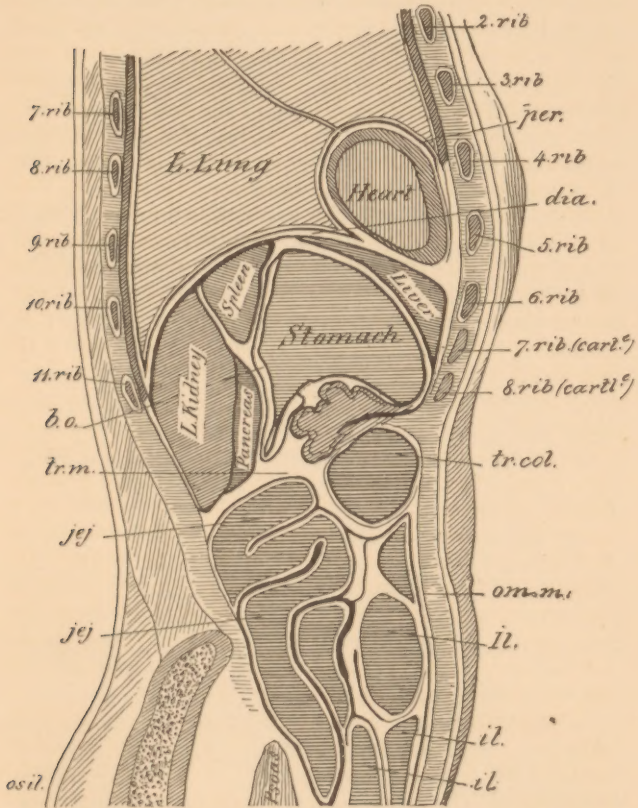


FIG. 1.—Vertical Section through the Human Body, one inch to the right of the External Margin of the ~~Right~~ Rectus Abdominis.

slight impression upon the liver, occupy the most dependent part of the right hypochondrium.

The left hypochondrium containing the fundus ven-

triculi, covered by the larger portion of the left lobe of the liver. A little further below lies the spleen, connected with the curvature of the stomach by the ligamentum gastro-lienale and the vasa breviora. In front of the spleen lies the left part of the transverse colon. That part of the epigastrium adjacent to the anterior abdominal wall contains a part of the left lobe of the liver, separated from the wall of the abdomen by the suspensory ligament. The pylorus and a portion of the duodenum are below the liver.

About on a level with the lower margin of the nipple (lower margin of ninth to eleventh dorsal vertebrae posteriorly), the diaphragm forms a figure-of-eight, whose knot is situated between the œsophagus and the pericardium. The peritoneal coat of these organs is incomplete at three portions: 1, at the suspensory ligament of the liver; 2, where the lobus Spigelii touches the minor omental bursa, at the lower surface of the liver; and 3, at the portion situated between the end of the bursa omenti and the posterior end of the peritoneal cavity, which adapts itself to the liver from in front.

Fig. 1 shows the upper half of the anterior surface of the left kidney covered by peritoneum, while the lower half is not covered by serosa, and is separated behind the stomach from the great omental bursa by the suprarenal capsule and the pancreas. The anterior surface of the stomach has a serous coat which faces the great peritoneal cavity, while its posterior serous coat forms the anterior wall of the great omental bursa. The posterior portion of the same covers the anterior surface of the pancreas and the end of the duodenum. The serous coat of the stomach running downward covers the transverse colon. The upper portion of the transverse mesocolon passes over to the pancreas, thereby forming the posterior wall of the great omental bursa, while the lower portion passes over into the mesentery of the small intestine.

These anatomical facts show that, with the exception of the cardiac region and the junction of the great and

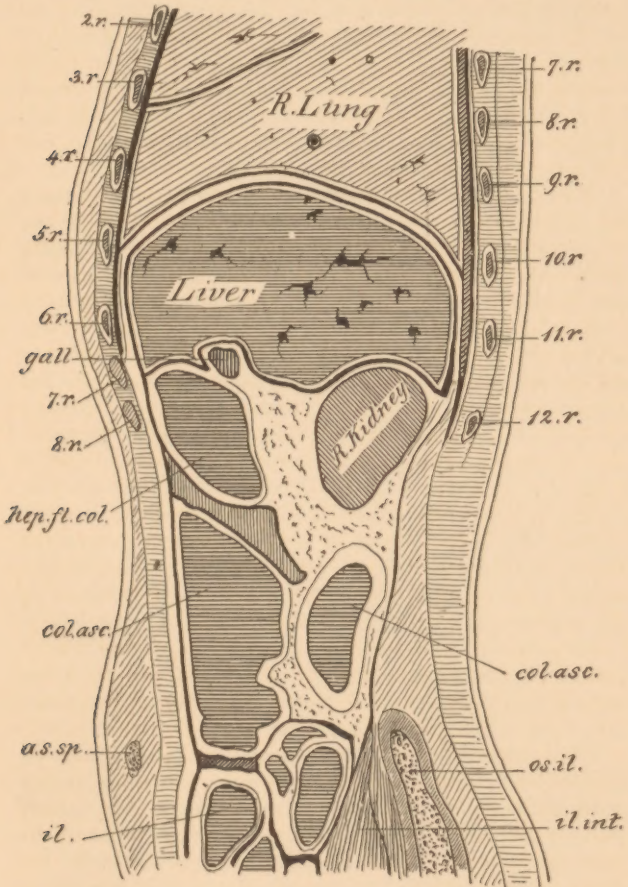


FIG. 2.—Vertical Section through the Right Rectus Abdominis.

small omental bursa, the stomach does not anywhere



adapt itself directly to the subphrenium, but touches it with a serous coat which comes from another organ. Consequently the stomach may be the medium of intraperitoneal as well as of extraperitoneal subphrenic abscess.

Extraperitoneal abscess could also originate from the left lobe of the liver, if it perforate alongside the triangular ligament into the subphrenic space.

On the right side (see Fig. 2), the whole diaphragmatic cavity is filled by the right lobe of the liver. Posteriorly the right kidney slightly indents the liver, touching the diaphragm with the upper half of its posterior surface and the psoas muscle with the lower half. The liver is covered with peritoneum from its lower margin up to the hilus. The posterior surface of its convexity, as well as its posterior margin and the posterior half of its lower surface, are not covered with peritoneum toward the median line, but have a peritoneal coat laterally. Only the upper surface adapts itself to the diaphragm directly.

In front of the lower surface of the kidney is the duodenum, partly covered by the serosa of the small omental bursa. In front of it is the pyloric portion of the stomach, whose anterior surface is coated with the serosa of the lower anterior surface of the liver. The transverse colon is often found in front of the pylorus, while neither the transverse nor the ascending colon has ever been found between the convexity of the liver and the anterior abdominal wall, as the external convexity of the liver always lies close to the abdominal wall.

The peritoneal coat of the liver sometimes embraces the gall bladder completely, forming a mesentery for it, from which it hangs; sometimes it merely passes over its under surface and binds it closely to the under surface of the liver. The pancreas is separated from the posterior surface of the stomach by the great and small omental bursæ, and lies very close to the diaphragm.

**Pathological Anatomy.** — Subphrenic abscesses



(synonyms: hypophrenic abscess, subdiaphragmatic abscess, subphrenic empyema, empyema hypophrenicum, pyopneumothorax subphrenicus, perigastric abscess, perigastritis, false pneumothorax, localized tympanites, suppurative perihepatitis, suprahepatic abscess, pneumoperforative peritonitis, subperitonitis) are divided into intraperitoneal and extraperitoneal.

In the first variety the abscess lies wholly within the peritoneal cavity. In the second variety the abscess wall may or may not be formed in part by peritoneum, but in any case only by its external surface. An important differential point in these conditions is, that, since an extraperitoneal abscess never detaches the peritoneal serosa of the diaphragm from it, it is perforce confined within narrow limits and consequently does not fill the subphrenium so completely as does one of the intraperitoneal variety. Another characteristic feature of the extraperitoneal form is that it has a greater tendency to perforate into the thorax, especially into the pleural sac.

Intraperitoneal subphrenic abscess assumes an entirely different significance according as it is located on the right or the left side of the falciform ligament. This ligament forms the median line between the right and left subphrenium. As the whole right subphrenic space is filled by the liver, the lower wall of an abscess situated on the right side is formed by the upper convexity of the liver; while on the left side the stomach, as well as the spleen, the transverse colon, and the left lobe of the liver, may form a wall.

Extraperitoneal abscesses are most frequently found on the right side. This is quite natural, since clinical as well as post-mortem observation has very often traced their source to the cæcal region. Rarely this form of abscess arises from the kidneys or ribs.

**Diagnosis.**—Regarding differential diagnosis, three questions most frequently arise, namely: Is the condition one of pyothorax, subphrenic abscess, or sub-

phrenic pyopneumothorax? The diagnostic points of these three conditions, as first advanced by Leyden, almost invariably remain authoritative. In subphrenic pyopneumothorax deep percussion above the retracted lung yields resonance. From the third rib downward it is generally full and tympanitic. Instead of liver dullness on the right thoracic margin, a profound and full sound is present. Below the right costal arch the liver is pushed far into the abdomen, and its lower border is easily recognized by palpation and percussion.

Auscultation shows the absence of respiratory murmur from the third rib downward. Amphoric breathing and metallic tinkling take its place. In auscultatory percussion, metallic phenomena are noticed. There is no vocal fremitus on the lower part of the right thorax. The succussion sound can be heard by shaking the patient. If the effusion can be made out by percussion on the lower thoracic portion, it is found to change its seat easily and quickly, whenever the patient is turned. If the effusion is situated on the right side, the heart will be slightly displaced toward the left, and *vice versa*.

It must be remembered, furthermore, that an admixture of gas is a characteristic feature of subphrenic pneumothorax. This gas is the product of putrid decomposition, and seems to give the pus a capacity for rapidly eroding the surrounding tissue. An exploratory puncture reveals ichorous pus of offensive odor. It is superfluous to say that when the admixture of gas is recognized by an exploratory puncture, a most valuable point for differential diagnosis is obtained.

The history is often an important guide as to the location of the abscess. In subphrenic abscess there is often a history of previous abdominal disturbance. On the contrary, there is no history of cough and expectoration. The heart is little, if at all, displaced, and there is no ectasy of the thorax or of the intercos-

tal spaces. In the lungs, vesicular breathing is found below the clavicle. Pectoral fremitus is also clearly perceptible. There is a well-marked limit to the region of vesicular breathing, below which the expiratory murmur is replaced by amphoric sounds. Deep inspiration pushes the boundary line of the region of vesicular breathing much farther down, into areas in which formerly no respiratory murmur could be perceived. This would indicate a well-marked separation

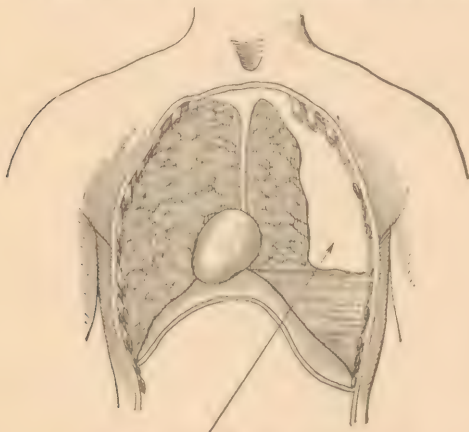


FIG. 3.—Left-Sided Pyopneumo-thorax.

between the lungs and the abscess cavity, the boundary line of the lungs protruding toward the abscess cavity during deep inspiration.

It is sometimes impossible to distinguish an encysted pleuritic effusion from a subphrenic abscess. The pathognomonic signs of such pleuritic effusions urged by Leyden were, absence of cough and expectoration, slight displacement of heart, and rapid change of note if the patient is rapidly turned. But, according to my observations,<sup>1</sup> pleuritic effusion, particu-

<sup>1</sup> "Pyothorax and its Treatment," MEDICAL RECORD, May 19, 1894.

larly pyothorax, sometimes occurs without these symptoms.

In reference to the absence of thoracic ectasy and the inversion of the intercostal spaces as pathognomonic of subphrenic pyopneumo-thorax, it must be said that Herrlich holds precisely the opposite view, and claims that ectasy of the lower thoracic sphere is a decided characteristic of the presence of this condition.

The motions of the exploratory needle, introduced

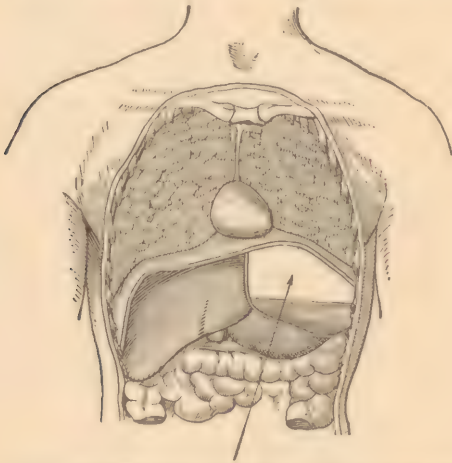


FIG. 4.—Left-Sided Subphrenic Abscess (containing gas).

into the abscess, were also regarded as pathognomonic by Fuerbringer. But, bearing in mind that in subphrenic abscess the function of the diaphragm is greatly impaired, and that, furthermore, the point of the exploratory needle may be fixed by the diaphragm as well as by the abscess membrane, neither the presence nor the absence of the motions can be regarded as determining pathognomonic factors.

If the diaphragm, being pushed up high, tightly ad-



heres to the thoracic walls, the needle may invade the subphrenic abscess without being fixed by the diaphragm. Consequently, even if the diaphragm should still be able to make respiratory movements, the needle would not necessarily be moved by them.

The value of Litten's diaphragma-phenomenon is not yet established. Jendrassik asserts his ability to note a well-marked concave undulating curve parallel to the costal margins in the mammary as well as the axillary line during deep inspiration. In one of his cases he based the diagnosis of subphrenic abscess upon this phenomenon. The correctness thereof was demonstrated by subsequent operation.

All these points go to show that, aside from the history, there are but few absolutely reliable pathognomonic data for the diagnosis of subphrenic abscess. Practically, however, it will make little difference to the surgeon whether pyothorax or subphrenic abscess is present, as the essential part of the treatment of either condition is free opening. The main question will always remain as to the presence of an abscess. Whenever suspicion exists, the introduction of the exploratory needle is a matter of course. The same aseptic precautions should be observed as in any other operation. The skin of the patient, as well as the hands of the surgeon, should be rendered clean, and the syringe and needle thoroughly sterile. If the first trial be negative, the needle should be introduced several times into different portions, as the pus cavity may either be of small extent, or may contain a cheesy accumulation, or, finally, may be divided into several minor cavities by adhesions.

In the first event the cavity may be missed altogether by the exploratory needle, and in the second the needle, being introduced into the solid cheesy mass, can draw no pus. After each negative result, therefore, a wire should be pushed through the needle (which must not be of too small a calibre). Thus

some pus, which had remained adherent to the inner surface of the needle, will become attached to the wire. Occasionally it will be useful to fill the syringe with sterile water after the operation, and force the water through the needle into a Petri dish. In case cheesy masses are present, small particles are sometimes drawn into the calibre of the needle which cannot be perceived by the unaided eye; but which, by being mixed with the sterile water, can be recognized under the microscope. In case the microscope does not give sufficient information, resort should be had to cultures of the fluid.

**Prognosis.**—Experience leads me to conclude that the prognosis of subphrenic abscess, except those of malignant origin, such as carcinoma pylori for instance, depends almost entirely upon early diagnosis. It has been my good fortune to lose none of the four cases I operated upon. This indubitably is owing to my cases being of a more favorable etiology than those generally found. I am confident that I shall meet with a higher mortality rate as soon as I have opportunity to see more cases. Still I may say that the mortality rate of fifty per cent., as given by Maydl, is much too high. Considering that Scheurlen's mortality rate was 82.5 per cent., while Sachs, in a series of six cases, lost none, it can clearly be seen that the kinds of cases reported differ notably. Furthermore, it must be considered that very few of the cases reported in the unfortunate series were operated upon. An approximate judgment can be based only on a large number of well-defined cases.

Spontaneous healing of subphrenic abscess is extremely rare, as is that of pyothorax. Perforation may take place into a hollow organ, like the stomach, or a bronchus, or the bladder. Literature shows spontaneous healing of subphrenic abscess six times in one hundred and four cases. As the mechanism of such natural healing is unknown to us, and therefore cannot

be controlled by any medical therapy, it can only be by chance that a cure is thus effected.

Since the pathology of appendicitis has been more widely recognized, poulticing and opium have ceased to be the panaceas. The expectant treatment of subphrenic abscess also will be discarded as soon as the condition has been more closely studied. I have already said that the important point in prognosis is the source of the abscess.

Microscopical and bacteriological examination of the aspirated pus gave no prognostic aid in my cases. But it may fairly be assumed that with greater interest in this disease and the higher development of our examining methods, more valuable information on these points will be obtained. It is to be regretted that, according to the reports of reliable investigators, most of the pus-culture experiments made so far were negative. Probably the microbes are dead, since even the pus taken from the subphrenic abscess of tuberculous patients has repeatedly failed to produce reaction when injected into rabbits.

Thus far the pus of these abscesses has been found to contain the staphylococcus pyogenes aureus, streptococcus, bacillus coli communis, bacillus pyogenes foetidus (Passet), micrococcus tetragonus, various species of proteus (Hauser), saccharomyces, and diplococcus citreus conglomeratus. As the analogy with pyothorax is obvious, it may be remembered that the pus of that condition shows streptococcus, bacillus tuberculosis, typhus bacillus, staphylococcus aureus and albus, and diplococcus lanceolatus (Fraenkel). In 109 cases of pyothorax Netter found streptococcus 50 times, pneumococcus 32 times, saprogenous microorganisms 15 times, Koch's bacillus 12 times. The presence of pneumococcus in subphrenic abscess would suggest a pulmonic origin. We know that the presence of streptococcus in pyothorax seems to favor the formation of solid masses in the effusion, and,

furthermore, that this coccus has a predilection for the infectious diseases of adults, whereas Fraenkel's coccus shows the most benign character of all microbes found in pyothorax. Whether this is accidental or not, and how much the analogy can be utilized for the prognosis of subphrenic abscess, the future must show.

Undoubtedly the prognosis is also influenced by the extent of the accumulation, the consistency, appearance and odor of the pus, the age and the constitution of the patient, the pulse, the temperature, and, perhaps the most important of all, the stage of the disease. Early operative interference will certainly reduce the percentage of mortality considerably. If the percentage of successful operations, as reported in literature, is still far from being satisfactory, it can be due only to disregard for this principle and to the fact that the unsuccessful cases are the result of a defect in diagnosis quite as much as in operative procedure.

In all these cases the autopsy showed the presence of another abscess, so that the essential condition for success, a thorough evacuation, was not fulfilled. In six cases, besides subphrenic abscess, pyothorax was present. In nine cases abscesses were present in adjacent organs, *i.e.*, in the spleen, liver, kidney, etc. In four cases the additional disease was suppurative peritonitis. In ten cases there was pneumonia, in addition to pyæmia, tuberculosis, actinomycosis of vertebræ, etc. In several cases an incision was made, but the abscess was not detected during life.

**Varieties** classified according to source.—By far the greater number of subphrenic abscesses are the result of pathological processes in the stomach. There may be direct perforation into the subphrenium, due to an ulcer or a neoplasm, or infection may occur through the lymphatics which drain that part of the stomach involved in the pathological process. Most of the cases reported, however, point to simple ulcerative processes as etiological factors.



The intestine is nowhere attached to the diaphragm. Consequently other conditions prevail here than in those organs which are in direct contact with the diaphragm. The experiments of Saenger very clearly illustrate the manner in which a subphrenic abscess may arise from the intestine. This author noticed that when he injected a solution of Berlin blue into the retrocaecal tissue, only a trifling amount of the colored solution could be driven around the caecum and alongside the linea innominata down to the inguinal canal. But the liquid column rose behind the ascending colon, formed a considerable fluid collection around the right kidney, and, passing the inferior horizontal portion of the duodenum, reached the dull margin of the liver and the diaphragm. Little fluid reached the transverse mesocolon, and none at all the mesentery of the small intestine. From this experiment the rule may be deduced that subphrenic abscess is more apt to arise from perforation of the caecum, ascending colon, or duodenum, than of the small intestine or transverse colon. The experience gained from autopsies is in entire accord with this theoretical assumption, as in thirteen intestinal cases, reported by Maydl, perforation of the duodenum was found eight times; of the colon, four times; while perforation of the ileum was found only once, and that, too, near the colon. It is of interest to notice that the etiological factor of these perforations of the gut, with the exception of one case which was caused by a foreign body, were all ulcerative processes. Traumatism could never be made out as a primary source. The ulcers of typhoid fever, since their favorite seat is the small intestine, cannot, according to Saenger's experiments, enter into the formation of subphrenic abscesses. Autopsies have shown that appendicitis causes subphrenic abscess by perforation from the appendix into the retroperitoneal space, the resulting abscess extending up behind the kidney and liver to the subphrenium. From the anatomical situ-

ation of the appendix, such abscesses are generally found on the right side, but in a few cases they passed from behind the right kidney, over the vertebræ, to the left kidney.

The great advance in the therapy of appendicitis, however, leads us to hope that the future will give us very little opportunity to study its sequelæ on the autopsy table.

We seldom see a case of echinococcus in this country, but in Germany, Austria, France, and England, where it is more common, it sometimes figures as a cause of subphrenic abscess. Of the subphrenic abscesses due to this cause, seventeen were operated upon, with the result of seven deaths. No case recovered after perforation of the abscess into the pleura, except those treated by operative means.

The starting-point is generally an echinococcus cyst, formed in the cellular tissue between the diaphragm and the liver. Such a cyst may, however, be developed between the diaphragm and the left kidney or the spleen, since both these organs are occasionally the seat of the parasite, and are both in contact with the diaphragm. Simon-Brown, Mosler, and Fiaux have reported abscesses from this source.

In what manner subcutaneous traumatism give rise to the formation of subphrenic abscess is not always manifest. The explanation may be that trauma originally causes a simple extravasation, into which pus-producing organisms emigrate from the neighboring intestine. These microbes are usually abundant in the gut and are found in tissues whose vitality has been lowered by trauma, a most favorable soil for their further development.

It is also conceivable that trauma producing a capillary separation in the continuity of kidney, pancreas, or liver, causes oozing of the secretions of these organs, which may then irritate and infect the adjacent tissue. Or a more extensive rupture of one of these

organs may cause the formation of an abscess within it, which later on might burst into the subphrenic space.

Sometimes trauma may be produced by an apparently insignificant amount of force. Simply lifting a heavy weight, for instance, is reported to have done it. Literature has seventeen cases with this etiology, six of them recovering after operation and two spontaneously.

The gall bladder and the intra- and extra-hepatic bile ducts naturally offer marked opportunities for the formation of subphrenic abscess. Bearing in mind that the anterior surface of the gall bladder adapts itself to the right inferior insertions of the diaphragm, it seems easy for inflammation of this organ to extend by means of the lymphatics, or by ulcerative perforation to the lower surface of the diaphragm. It may be that a stagnation in the flow of bile favors infection of the gall passages from the intestine. Retention cysts containing bile may originate in the liver itself as well as on its surface, and may burst and discharge into the subphrenium. Thus subphrenic abscess may arise from purulent cholecystitis terminating in ulceration and perforation, or from cholangiectasia due to obliteration of a large gall duct, or from cholangioitis terminating in purulent hepatitis, or from purulent inflammation of the ductus communis choledochus itself, followed by rupture.

There are reports of sixteen cases of cholangioitic origin (mine excepted). Of these, fourteen were not recognized until the autopsy, while two were operated upon successfully. In several of the cases gall stones were found. In all of them, naturally, the subphrenic abscess was located on the right side. Every one of the patients had complained of well-defined acute pain in the right hypochondrium.

The anatomical situation of the kidneys gives them an important relation to the formation of sub-

phrenic abscess. According to Hyrtl's anatomy and to Maydl (Figs. 1 and 2), the kidneys are situated in the lumbar region of the abdominal cavity, and are covered in front by peritoneum. The right kidney lies in contact with the ascending, the left one with the descending, colon. They are bounded behind by the lumbar portion of the diaphragm, and above by the suprarenal capsules. The left kidney extends a little higher into the pleural domain, so to speak, than the right, so that in perforation from the renal sphere into the pleura, the left side is more frequently concerned than the right.

The most frequent cause of perinephritic abscess is a primary perinephritis, arising from a contusion in the renal region or from one of the infectious diseases. Another cause may be pyelonephritis calculosa, suppurativa, or tuberculosa. Repeated exposure to cold can scarcely be considered an etiological element.

Since suppurative pyelonephritis is most often the outcome of disease of the uropoietic apparatus, viz., prostatitis, stone, carcinoma of the bladder, etc., it will be wise to reflect upon the possibility of the formation of a subphrenic abscess in all such conditions.

The lower border of perinephritic subphrenic abscess is generally formed by the ascending or descending colon, sometimes by the duodenum.

In reference to diagnosis, it is maintained that if the abscess occupies the whole anterior or posterior surface of the kidney, there is generally tenderness or pain, swelling and œdema on the anterior surface of the abdomen. My own experience, however, does not accord with this, as, with the exception of pain, I found no local symptom in one of my own cases (Case II.) even seven weeks after the onset of the disease.

If the abscess has formed on the upper surface of the kidneys, pleuritic symptoms, combined with œdema of both legs, jaundice, ascites, and vomiting may be observed.



Of eleven such cases reported in literature, only one was saved, the unfavorable course probably being due to delayed diagnosis. Perhaps, too, the kidney is so much affected in this condition that nephrectomy should be added to the operation for evacuation of the abscess.

Subphrenic abscess originating in the ribs (from a tuberculous focus, as a rule) is of rare occurrence. If situated on the right side it may easily be confounded with cholangioitic subphrenic abscess. In the cases reported in literature, the tuberculous process was localized, and there was consequently quick recovery.

The great tendency of subphrenic abscess to perforate into the thoracic cavity has been alluded to before. On the other hand, there are subphrenic abscesses of true thoracic origin. The most frequent purulent affections of the thoracic cavity are pyothorax and abscess of the lung. Suppurative pericarditis is rare. A circumscribed pyothorax may perforate directly, while abscess of the lung will first produce an inflammatory adhesion of the adjacent visceral and diaphragmatic pleura. Free pyothorax has a tendency to perforate the middle of the diaphragm.

Of nine cases reported in literature, one case recovered spontaneously by perforating into the gut; one after surgical operation; three died with, four without, surgical interference.

Metastasis is another important etiological factor, but is, as a rule, observed only in the tropics. It has been found after trauma in connection with pyæmia (septic phlegmon of the forearm and tuberculous coxitis [Godlee]); following ulcerative processes in the digestive tract (perforation of fishbone into the vena portæ); and associated with fistula ani and gangrene of the appendix. Abscess of the spleen, perforating into the portal branches, as well as suppurative processes in the mesentery and mesenteric glands, may cause abscess of the liver. Malaria, enteritis, and dysentery

may do the same. In tropical dysentery Koch<sup>1</sup> could always prove the presence of amœbæ in portions of the intestine, and regarded them as the etiological factor. Abscesses of the liver were also demonstrated by von Bergmann. Other authors claim that such amœbæ are not the cause of the abscess, but only the characteristic admixture of the secretion transported from the seat of ulceration to the liver.

An attempt was made to obtain cultures from the pus of thirteen cases of dysenteric abscess of the liver. In eight cases the results were negative. Among the positive results staphylococcus pyogenes aureus was found twice; staphylococcus albus, bacillus pyogenes fœtidus and proteus, once each. But in sections and cover-glass preparations amœbæ were found in every one of twenty-two cases. In ten cases they were mixed with bacilli. Of eleven cases reported in literature, ten died. In one case recovery was obtained by surgical interference. Only two of the fatal cases were operated upon.

A wound inflicted directly in the diaphragmatic space may also in rare instances cause subphrenic abscess, somewhat as do the subcutaneous traumata defined above. The wound is generally produced by a bullet. There are in the literature reports of autopsies in four cases. The liver, kidneys, and thoracic cavity may be involved at the same time.

Besides the varieties described above, another group of subphrenic abscesses must be mentioned, whose original sources either are questionable or cannot be discovered. Eleven such cases are reported in literature. In three of them successful operations were performed. One recovered after perforation into a bronchus. The other seven died under expectant treatment. In one case actinomycosis of the vertebræ was found, while there was pyosalpinx in the case which finally perforated into a bronchus.

<sup>1</sup> Gaffky, "Reports on Investigations of Cholera," 1883.

In those cases of subphrenic abscess originating in diseases of the female sexual organs, *e.g.*, endometritis, pyosalpinx, perimetritic exudations, the route to the subphrenium is through the retroperitoneal space.

**Course.**—As said above, subphrenic abscess may arise from infection carried from an area of suppuration by means of the lymphatics. It oftener originates in an abscess of an adjacent organ, which bursts into the subphrenium. The fistulous tract representing its route may then become obliterated, or may remain and gradually grow larger.

If perforation of a subphrenic abscess into a lung has taken place, the rusty sputa and their offensive odor, as well as that of the breath, together with the microscopical demonstration of elastic fibres, point to a limited gangrenous process as the initiative factor of the perforation.

The cough, which then is always present, generally brings up fetid pus, in which particles of food, such as starch grains or margarin crystals, can be seen by the naked eye or demonstrated by the microscope. This would, of course, point to a gastro-intestinal or cholangioitic source.

While in a small number of such cases recovery is obtained by the perforation, the majority of patients succumb either to the shock of the perforation itself, or to a foreign-body pneumonia later on. The symptoms of perforation into the pleura consist in intense pain, rapidly developing dyspnoea, and collapse; while those of perforation into the peritoneal cavity are identical with the well-known symptoms of the general type of peritoneal perforation.

**Therapy.**—The treatment of subphrenic abscess must be surgical. Before the days of asepsis, the surgeon very properly hesitated to open the chest or abdomen, but now such fear need no longer prevent him from procuring timely evacuation. Such evacuation can be thoroughly effected only by wide opening.

This can usually be secured by resecting a piece of a rib, as the subphrenic abscess is generally within the extent of the ribs. Very exceptionally, it must be approached below the costal arches or the xiphoid process. I cannot agree with those authors who pronounce it a misfortune for the patient when the abscess is reached by the transpleural route. On the contrary, it seems to me that no other route, excepting the lumbar, offers so many advantages in after-treatment, as a rule.

While for prognostic purposes it is important to know whether the pleuræ are adherent or present a cavity filled with serum or pus, so far as surgical procedures are concerned it makes very little difference. The adversaries of the transpleural route maintain that to open the pleural sac, if it be in a normal state, would expose it to the dangers of pneumothorax, as well as to infection from the atmosphere or from the escaping pus.

Regarding the first objection, pneumothorax, it must be borne in mind that in subphrenic abscess the aspirating power of the diaphragm is greatly impaired. As is evident by the dulness on percussion, the diaphragm is pushed so far up toward the thoracic cavity as to be pressed against the thoracic walls to a considerable extent, and to have its summit brought into permanent contact with the costal pleura. It may even have been so overstretched as to be entirely paralyzed. Furthermore, the lower part of the thorax itself is generally expanded, thus diminishing its aspirating power. When pneumothorax does occur after the exposure of the pleural sac, and a feeble patient suffers shock, final incision and evacuation may be deferred until the following day.

In reference to atmospheric infection, I may refer to Petri's and Cleves-Symmer's experiments, which demonstrated bacteriologically what had long appeared probable from clinical observation, viz., that the mi-



crobes contained in the atmosphere are non-pathogenic under ordinary circumstances. Furthermore, I do not see why the pleura should be more inclined to become infected than other parts of the body, provided thorough aseptic prophylaxis has been observed.

While the incision should be made in the centre of the dull area, the exploratory needle will always indicate its ultimate route. The technique of the operation is practically the same as that of resection of a rib for pyothorax. As a rule, the eighth, ninth, or tenth rib is selected. I preferably choose the median axillary line, as thence the abscess walls can be reached equally well in front and behind. It also enables the patient to be brought to the edge of the table during the operation, and permits him to assume the dorsal decubitus; whereas, if the incision were

made farther back, he would be obliged to lie on the healthy side, thus rendering evacuation more difficult.

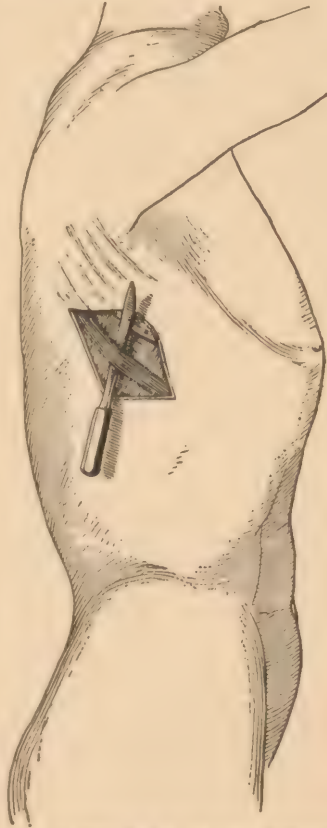


FIG. 5.—Resection of Rib (rib riding on the elevator).

If, however, the dull area, as sometimes occurs in abscesses of small extent, is situated distant from the median axillary line, the resection must take place at the point where the aspiratory needle revealed the pus.

It goes without saying that thorough aseptic precautions must be taken. Particular attention must be given to the skin of the patient and to the hands of the surgeon, scrubbing with green soap for three or four minutes, then washing with alcohol or ether, and subsequently with bichloride (1 to 500). To sterilize the skin of the patient thoroughly, it is advisable to cover the field of the operation for from ten to twenty hours with a large poultice of green soap, and allow this to remain until shortly before the operation. Should this tend to produce a dermatitis, a bichloride fomentation should be substituted. All the paraphernalia needed at the operation must, of course, be sterilized; the instruments, ligatures, etc., in boiling soda-solution, and the towels, sponges, etc., in steam. If no sterilizer be at hand, towels, sponges, etc., can also be sterilized in boiling water. The incision, about four inches in length, should be made directly down to the periosteum of the rib selected. Its direction must, of course, be parallel to the margin of the rib. An incision is then made along both borders of the rib, and the periosteum both in front and behind is raised by means of an elevator.

Having freed the periosteum, the elevator is pushed beneath the rib, between it and its posterior periosteum, and allowed to rest on both edges of the wound (Fig. 5). With a blunt hook the tissues are retracted along the rib toward the axilla, and by means of the bone scissors the rib is then cut between hook and elevator. Next, the elevator is pushed toward the sternum, forcing the rib from the last fragment of adhering periosteum; the retractor is inserted into this end of the wound, and with the scissors the same ma-

nœuvre is executed. If my own elevator shears<sup>1</sup> are used, nothing is needed but to tear away the connection between the periosteum and the rib and divide the rib, the instrument being of such a shape as to keep the tissues properly retracted. One blade, if separated, can be used as an elevator, so that, with nothing else at hand than a knife and these shears, practically the whole operation could be performed. A piece three inches in length, or at least large enough to allow introduction of the finger, usually suffices for the purpose of drainage. It is impossible to strike the intercostal artery during these manipulations on account of its anatomical situation, while in performing simple incision this accident has frequently occurred (fatal hemorrhage was reported in Billroth's clinic).

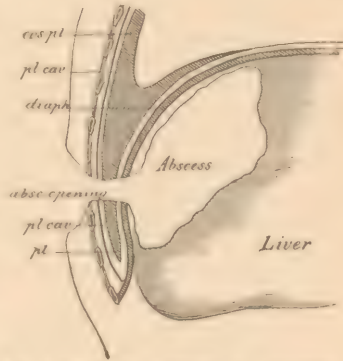


FIG. 6. Thoracic Opening in Subphrenic Abscess.

A saturated solution of iodoform in ether is then spread upon the wound surface, to form a protection against the pus.

The very thin thoracic fascia and the costal pleura are now incised, and if the pleural sac be found empty the pus cavity is located by means of the exploring needle, and an opening is made through the diaphragmatic pleura just large enough to permit the introduction of a grooved director. Before this aseptic tampons are packed into the pleural sac to occlude it from the escaping pus. This precaution renders oc-

<sup>1</sup> Osler, Centralblatt für Bacteriologie, Bd. 7, No. 23.

clusion of the pleural cavity by suturing unnecessary. As soon as pus appears in the groove of the director, a small Péan forceps is introduced and the opening gently dilated. Evacuation of the pus should take place slowly (it may consume twenty to thirty minutes). A sponge should be pressed against the opening from time to time to interrupt the stream, so as to avoid too rapid expansion of the lungs. If the condition of the patient permit, the finger is now introduced and any solid masses, such as fibrinous lumps or necrosed tissue adhering to the abscess wall, are wiped out with the index finger or with a blunt spoon made for this purpose. For inspection, my dilating speculum<sup>1</sup> can sometimes be used to advantage. If hemorrhage should occur or if signs of shock present, such procedures may be deferred for a day or two, as may also irrigation of the cavity with a sterile normal salt solution, which is used to secure thorough evacuation. When malodorous pus is found, an antiseptic wash, preferably bichloride, 1 to 5,000, is used for this once, instead of the sterile salt solution.

The pleura or the edges of the diaphragm are stitched to the skin with four silk sutures (preferably iodoform silk), one at each end of the wound and one on each side, with strong Hagedorn needles. Thus the wound surface is entirely covered and the adjacent tissues protected against infection. At the same time secondary hemorrhage is thereby prevented and the wound kept open. Then the cavity, if of small extent, is packed with iodoform gauze.

In pyothorax about one ounce of an emulsion of iodoform glycerin (one-half ounce in children) is infused into the cavity besides. But if the cavity be very large, a drainage tube, five-eighths to three-fourths of an inch in diameter, is introduced and secured by two large safety pins arranged in the shape of a cross.

<sup>1</sup> Beck, "Modern Theory and Technique of Surgical Asepsis." Saunders, Phila., 1895, p. 213.



(In pyothorax I refrain from introducing it immediately after operation, for I have seen much hemorrhage follow its immediate introduction. No doubt the constant motion of respiration produces friction against the drain, which accentuates the irritation already produced by contact of the wound with the air; whereas, after the tissues have in a measure recovered from this shock and granulations have begun to form, *i.e.*, after about three days, a soft rubber drain is well borne.) Recently, however, I made it a rule to resect two to three ribs in large hypothoracic cavities in order to be able to pack the cavity with gauze entirely, which procedure seems to me to be the ideal surgical treatment of an abscess. The cavity is then covered with iodoform gauze. The whole side is protected with a large piece of mossboard, which, after being slightly moistened, adapts itself to the contour of the body like a plaster-of-Paris dressing. A strip of rubber adhesive plaster serves to exclude the air. So the mossboard during respiration acts like an aspirating valve and aids the absorption of the wound secretion at the same time.

Particularly in pyothorax, retention of pus is prevented if the patient always lies on the diseased side, and if his feet are elevated every few hours to compel the pus to flow into the dressing. A pillow may also be pushed underneath the opening at the most dependent part. At a superficial glance this advice may appear rather strange, but clinical experience shows that the observance of this method is apt to prevent retention, and it is needless to urge the importance of never allowing stagnation of pus in a cavity. This also renders unnecessary the counter-openings advised by Kuester.

It is only after the rigorous procedures described above that the cavity can be pronounced entirely evacuated. No necessity of subsequent irrigation arises, which, besides being irritating, destroys those

very adhesions which are much needed for the obliteration of the cavity. (How important these adhesions are for the agglutination of the pleura, for instance, was emphasized as early as 1865 by Dr. A. H. Smith, of this city.)

Two weeks after the operation a smaller and shorter drain is introduced. After another week this second tube must be shortened. When the discharge becomes serous and scanty the tube may be dispensed with, and a small strip of iodoform gauze or a wick substituted for a day or two. For the next few days the patient must be watched very carefully. The cavity may be obliterated after twenty-four hours, but very often the union is only superficial and retention of pus occurs, as shown by an elevation of temperature. In such case the drainage tube must be re-introduced and after a week its shortening repeated, until for about four days after the obliteration of the pus cavity no discharge appears and the temperature remains normal. In a doubtful case careful introduction of a grooved director through the scar tissue may reveal the presence of retained pus. The dressing should be changed twice a day for the first week; later on once a day, and after three weeks it will suffice to change the dressing every second, third, or fourth day.

The patient, if at all able, should get up after one week. During after-treatment, for the first few days small doses of morphine are administered for the purpose of immobilization. If the pulse be weak, strophanthus or caffeine may be added. Nourishment is given frequently and in small quantities to avoid overdistention of the stomach.

Full anæsthesia should be administered only if the pulse is strong. This is an exceptional circumstance in the case of abscesses that have existed for a long time. It is well known to what immense dangers a general anæsthetic exposes the thoracic organs when their functions are much impaired by compression.

Ether being contraindicated in every respiratory disturbance, only chloroform could be employed, and I need not call attention to the danger to which the use of this paralyzing drug subjects the heart, which in these cases is always either displaced or somewhat compressed. Since the operation takes but a few moments, it would be better when an anæsthetic is required to use an ether spray. Even cocaine has its dangers.

If resection for subphrenic abscess is done anteriorly, an incision must be made from the anterior axillary line between the seventh and eighth rib (see Fig. 7). Having divided the fascia of the external oblique muscle, the seventh and eighth ribs are exposed and resected. The further procedures are the same in this operation as described above.

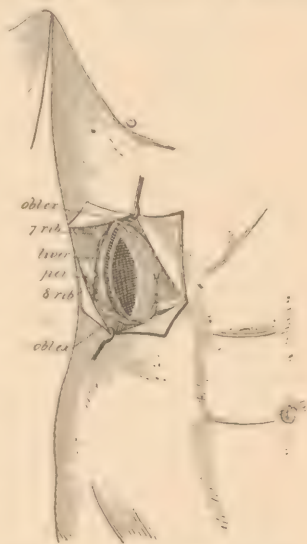


FIG. 7.—Anterior Resection in the Seventh Intercostal Space.

The lumbar route (Fig. 8) merits special consideration in subphrenic abscesses of perinephritic origin. The incision in such cases should begin on the prominence of the sacro-lumbalis muscle and extend to the anterior axillary line. After the thick lumbo-dorsal fascia and the latissimus dorsi and serratus posticus inferior muscles are cut through, the sacro-lumbalis muscle is drawn toward the spinal column. The lumbo-costal fascia is next divided and the quadratus lumborum muscle appears running vertically, parallel

to the border of the sacro-lumbalis muscle. A grooved director, introduced alongside the outer margin of this muscle, will lead to the pus cavity, which, after being carefully and slowly evacuated, must be packed with iodoform gauze. The after-treatment should be conducted according to the principles of aseptic open-wound treatment.

**Histories.**—A striking feature of the cases below is that they all concern the right side, and all occurred in men in the prime of life.

CASE I.—F. G——, of this city, forty-three years of age, clerk. Family history good. On May 14, 1894, he was suddenly seized with violent pain in the right side radiating up to the axilla, nausea and slight dyspnœa. Under the application of an icebag and administration of codeine, Dr. L. Bischof, of this city, noticed marked improvement until four days later. Then the pain set in as violently as before. At the same time fever and slight jaundice developed.

When I saw the patient, May 21st, I found the following condition: Stout man (weight about 200 pounds), very restless and occasionally delirious. Hiccough. Temperature,  $103.2^{\circ}$  F.; pulse, 124; respiration, 26. Face icteric. Pupils of equal size, reacting well. The tongue thickly coated. Mucous membranes pale yellow. Percussion note normal on the left side; on the right side, dulness from the upper margin of the sixth rib to two inches below the costal arch in front, and clear sound from the middle of the scapula downward behind. Auscultation revealed vesicular breathing on the left and anteriorly on the right side. Posteriorly from the middle of the scapula, bronchial breathing. Below the eighth rib no respiration could be heard. Vocal fremitus normal. Pulse small but regular. Abdomen distended and its walls tender. Percussion tympanitic. Urine scanty, containing no albumin. The patient had had no evacuation of the bowels for three days.



On account of the absence of previous respiratory symptoms, particularly of cough, the diagnosis of subphrenic abscess was made, its location as well as the jaundice pointing to a cholangioitic origin. The exploratory puncture, made in the anterior axillary line, seventh intercostal space, corroborated the diagnosis of abscess. Operation was refused, and death occurred four days later.

CASE II. (presented at the New York Post Graduate School, December 19, 1890, and at the Medical Society of the German Poliklinik, October 11, 1895).—F. B——, of this city, forty-two years of age, grocer, married. Family history good. Father of five children; four of them are in good health; on the fifth I had performed resection for tuberculous hip. The patient had never been sick before. In September, 1889, he noticed a slight pain around the angle of the right scapula. One week later, about September 17th, he became feverish and the pain extended over the whole right side. No cough was present. The family physician called it pleuritis. Temporary improvement and normal temperature followed, as reported to me, alternating with attacks of fever and pain of varying intensity for fully seven weeks. During this period the patient was seen by many physicians, who variously pronounced the condition pleuritis, cholelithiasis, nephritis, carcinoma of the liver, carcinoma pylori, and muscular rheumatism.

On November 5th I saw the patient for the first time, and found the following condition: Emaciated man of medium stature; weight about ninety-five pounds. Face very pale. Appearance of a grave disease; so weak as to be scarcely able to move. Tongue shown with apparent difficulty. No swollen glands. Temperature, 100° F.; pulse, 116; respiration, 24. Percussion and auscultation revealed normal conditions on the left side (see Fig. 9). On the right side there were diminution of respiratory sounds and vocal

fremitus below the margin of the eighth rib. In the posterior axillary line, there was dulness from the lower margin of the eighth rib to the upper margin of the third lumbar vertebra. In the posterior axillary line, roughened expiration. No râles, no cough, no expectoration.

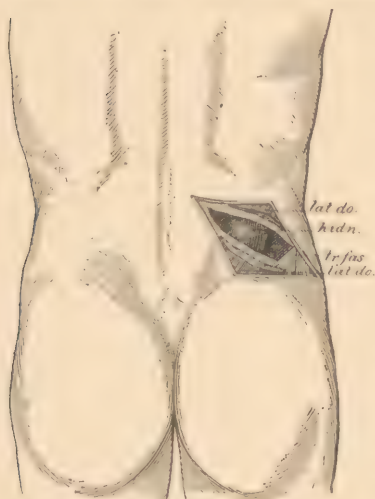


FIG. 8.—Lumbar Route. Incision passing under the Twelfth Rib.

Heart normal. Pulse soft and regular. Right hypochondrium slightly more convex than the left. Dulness alongside the spinal column from the upper margin of the tenth rib and along the middle axillary line from the seventh intercostal space. Turning the patient made no change in the limit of the dull area. Anteriorly the liver overlapped the costal arch a little less than an inch. The

right hypochondrium was painful to the touch. No tumor nor fluctuation could be felt. Constipation. Urine scant, containing no albumin but abundant sediment. No microscopical evidence of nephritis. Patellar reflex normal. No paresis. Slight hicough.

Perinephritic abscess was suspected because of the pain in the right lumbar region, the remittent fever, and the extent of the dulness. An exploratory needle was introduced five times at different points of the dull area, with negative results. A sixth puncture, made

this time in the tenth intercostal space, brought out thick yellow pus.

The patient was immediately transferred to St. Mark's Hospital, where operation was performed the following day by making an incision along the outer margin of the sacro-lumbalis muscle. To get

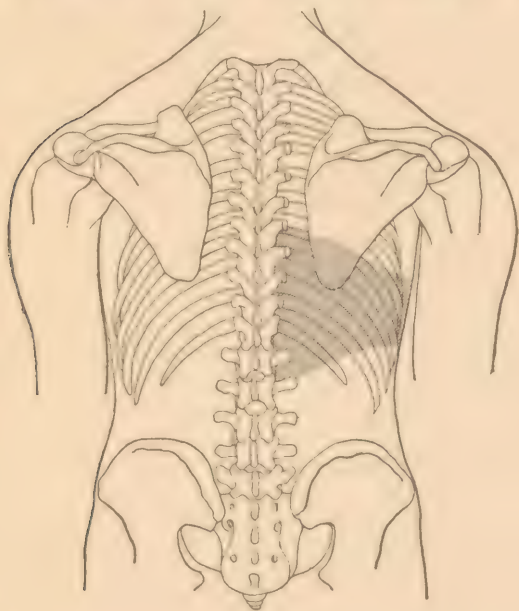


FIG. 9.—Dull Area. Slight Protrusion of Right Hypochondrium.

better access, the eleventh and twelfth ribs were resected without interfering with the pleura. On pushing a grooved director past the outer margin of the sacro-lumbalis muscle, pus appeared. The opening was then dilated. After about half a pint of thick, cheesy pus had been discharged, the right kidney as well as the diaphragm could be inspected. The cavity was

cleansed and packed with iodoform gauze. Uninterrupted recovery followed, and the patient was dismissed from the hospital five weeks after the operation.

CASE III. (presented to the German Medical Society of New York City, June, 1892).—A. M—, of South Carolina, thirty years of age, merchant, single. Family history good. The patient had never been sick before. In August, 1891, he was taken with repeated chills, disturbance of digestion, and emaciation. He was at first treated for malaria at his home. Later, when a slight cough set in, a diagnosis of pulmonary tuberculosis was made. As it was just at the time when Koch's tuberculin was being tried, the patient was sent to the institution of Dr. Aronson, of this city, to receive injections of tuberculin. Dr. Aronson, however, came to the conclusion that the patient suffered from abscess of the liver, and sent him to St. Mark's Hospital for surgical treatment.

On February 13, 1892, he presented the following condition: Emaciated man, of medium stature; weight about one hundred and twenty pounds; face and mucous membranes pale. Tongue thickly coated. Temperature, 101° F.; pulse, 120; respiration, 44. Profuse perspiration. Abundant expectoration. Sputa yellow and sometimes of a copper tint. Region of the liver painful to touch. Appetite poor. Considerable dyspnoea. Percussion and auscultation reveal normal conditions on the left side. Percussion on the right side showed complete dulness in front from the upper margin of the fourth rib to two inches below the costal arch (see Fig. 10). Posteriorly complete dulness from the angle of the scapula to the lower margin of the tenth rib. Auscultation revealed râles from the clavicle down to the fourth intercostal space. Below this area there were no respiratory sounds at all. In the infrascapular fossa there were dry râles and amphoric breathing. No change in the limit of the dull



area upon turning of the patient. Diminution of vocal fremitus on the right side. Urine scanty; no albumin. Constipation.

Operation under chloroform on February 10th, at St. Mark's Hospital. Typical resection of the eighth rib in the median axillary line. Evacuation of two and one-half pints of brown, cheesy, malodorous pus upon opening the pleural sac. To gain space a long piece of the ninth rib was resected.

Inspection of the immense cavity revealed a communication with the subphrenic space. Blunt dilatation brought out two ounces of the same kind of pus from this sinus. On irrigating the cavity with bichloride of mercury (1 to 10,000), great dyspnoea set in, the patient's face becoming cyanotic. After a violent fit of coughing the dyspnoic symptoms entirely disappeared, the patient improving very rapidly under the usual treatment; but whenever the cavity was irrigated the same phenomenon supervened. During the coughing brown sputa mixed with arterial blood were occasionally expectorated. This could leave no doubt as to the existence of a communication with the lungs.

Six months after the operation the patient had gained thirty pounds and was in excellent health. But a thoracic fistula remained; wherefore I resected six inches of the seventh and tenth ribs. The cavity then became much smaller, but the patient could not be persuaded to stay until perfectly recovered. Subsequently, however, as I am informed, recovery was complete.

A particularly interesting feature of this case is the question of the mode of perforation. It seems to me that the subphrenic abscess, most probably being of a cholangioitic origin, first perforated the lungs and then the pleural sac, whence it may have perforated the diaphragm a second time, thus forming a true "vicious circle."

CASE IV. (presented to the New York German Medi-

cal Society, February 3, 1896, and the New York Academy of Medicine, February 6, 1896).—F. S—, of this city, thirty-one years of age, shipping-clerk, single. Family history good. According to Dr. E. Mayer, of this city, he was seized on March 24th with violent pain in the right side, nausea, and rapid pulse. These symptoms disappeared in two days under the administration of morphine. The diagnosis at that time was gall-stone colic. The patient resumed work, at which

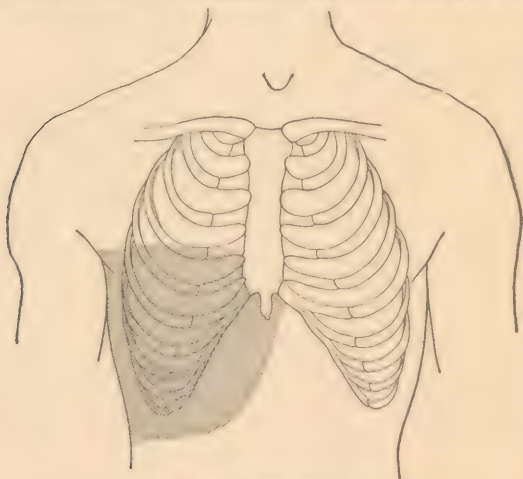


FIG. 10.—Case III. Dull Area.

he continued for three weeks, when suddenly he was again seized with intense pain of the same character in the same place. Temperature was about 101° F., but the pulse was very rapid. This time the pain persisted with varying intensity for ten days, when the patient was again able to attend to his business. Four days later the attack was repeated, this time dyspnoea being the predominant symptom.

On May 3, 1895, I found the following condition: Tall man, slightly emaciated; weight about one hun-

dred and forty pounds. Face slightly yellowish-brown. Great dyspnea (respiration, 64). Tongue thickly coated. No appetite. Right hypochondrium not protruding. No cough. Slight expectoration. Temperature, 99.5° F.; pulse, 126. Percussion in front revealed complete dulness, from the upper border of the fourth rib down to the line of the umbilicus (see Fig.

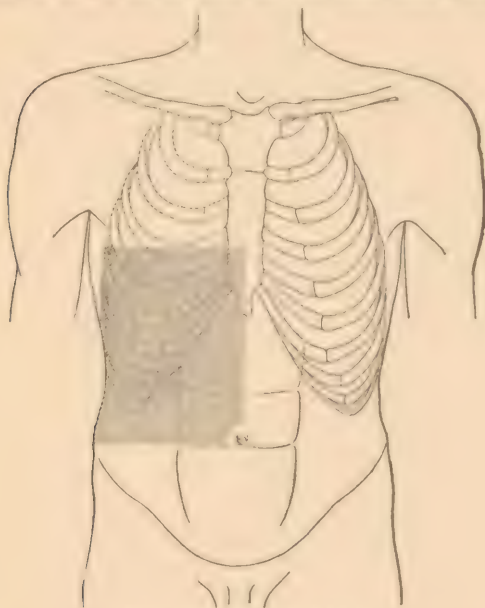


FIG. 11. Case IV. Dull Area.

11). In the axillary line the same condition obtained. In the paravertebral line there was complete dulness, from the spine of the scapula down to the spinous process of the eleventh dorsal vertebra. Throughout the extent of the dulness there was no vocal fremitus. Percussion and auscultation from the fourth rib up to the supraclavicular region normal. Auscultation re-

vealed vesicular breathing, rough expiration, and râles. The same condition behind. Amphoric and metallic sounds could not be made out. Whenever the patient was laid on the left side, a tympanitic sound took the place of the dulness from the upper margin of the ninth

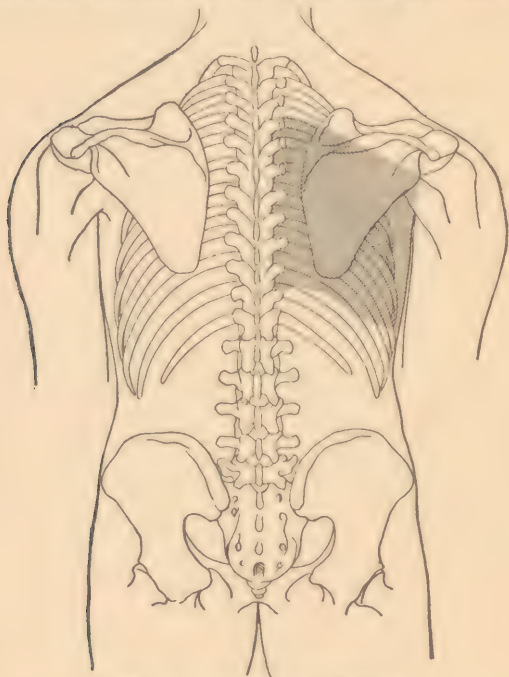


FIG. 12.—Dull Area (posteriorly).

rib downward. Urine scanty, no albumin. Constipation. Considering the temperature, the great pain, the dulness, and the former history, the diagnosis of subphrenic abscess seemed justified. The subphrenic location of the abscess was rendered more probable by the entire absence of respiratory symptoms. The



dyspnœa could easily be produced by the pressure of the accumulation. Exploratory puncture in the eighth intercostal space, in the posterior axillary line, revealed thick, brown pus. Bacteriological examination revealed diplococci which could not be defined. Cultures of *proteus vulgaris*, *diplococcus citreus* conglomeratus, and *bacillus coli communis* were obtained.

The patient was sent to St. Mark's Hospital, where the operation was performed on May 4th, under incomplete chloroform anæsthesia. After resection of the tenth rib the pleural cavity was opened. It was empty, and air rushed in with considerable noise. The face of the patient assumed a cyanotic appearance, and the pulse entirely disappeared. Fearing to proceed further, I packed the cavity with iodoform gauze. Under the administration of stimulants the patient soon rallied, and on the following day, having used the aspirating needle as a guide, I introduced a grooved director through the diaphragm into the abscess and slowly dilated the opening. Red-brown clots and thick pus tinted with dark blood were evacuated. The edges of the diaphragmatic incision were sewed to the skin. Typical dressing. Uninterrupted recovery. Discharged from the hospital cured, June 15, 1895. The microscope yielded no information as to the origin of the abscess, but the clinical symptoms pointed to a cholangioitic source.

CASE V. (presented to the Medical Society of the German Poliklinik, October 11, 1895).—H. M——, a Cuban, thirty-nine years of age, married, employed in the sugar business. On June 15, 1895, he was taken with diarrhœa, tenesmus and pain in the epigastrium, with repeated chills. Later on, cough. At first the patient was told that he had malaria; later on, dysentery; and when the cough set in, pulmonary tuberculosis. At the beginning of July he removed to Jersey City Heights, where he improved slightly under anti-tuberculous treatment. On July 22d, Dr. Morvay-

Rottenberg, of this city, diagnosed pyothorax, and sent the patient to St. Mark's Hospital for surgical treatment.

On July 24th, the following state was found: Emaciated individual, of phthisical appearance; weight about ninety pounds. Tongue thickly coated. No appetite; slight dyspnœa. Urine scanty; no albumin. Constipation. Temperature normal; pulse 110; respiration 42. The right hypochondrium did not protrude. Percussion in front revealed complete dullness from the lower margin of the third rib to one inch below the costal arch. Posteriorly (see Fig. 12) there was complete dullness from the third to the tenth intercostal space. The region in front, from the supraclavicular fossa down to the fourth intercostal space, was slightly tympanitic, as it also was behind from the supraspinous fossa to the third intercostal space. No respiratory sounds over the dull area. No change in the limit of the dull area on turning the patient. Râles from the supraclavicular fossa down to the third intercostal space. Cough and expectoration frequent. The yellow sputum did not contain tubercle bacilli. The exploring needle revealed thin, malodorous, yellowish-white pus, mixed with fibrinous flakes and gas. Bacteriological examination showed the presence of *bacillus coli communis*, *staphylococcus pyogenes aureus*, *bacillus pyogenes fœtidus*, and *proteus vulgaris*. Taking into account the presence of respiratory disturbances, especially cough and expectoration, and the extent of the dull area, I diagnosed pyothorax.

On July 25th, resection of ninth rib in the median axillary line was made, under incomplete chloroform anæsthesia. The pleural sac was found empty. No pneumothorax. After careful introduction of the exploring needle through the diaphragm and gradual dilatation, a pint and a half of sero-pus was discharged. Typical dressing. Uninterrupted recovery. Discharged from the hospital cured, August 21, 1895.



